Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector Technology

Participant
Otter Tail Power Company

Additional Team Members
Montana-Dakota Utilities—co-host

NorthWestern Public Service—co-host

W.L. Gore & Associates, Inc.—licensee and filter bag provider

Energy and Environmental Research Center (University of North Dakota)—concept developer

Location
Big Stone City, Grant County, SD (Montana-Dakota Utilities and NorthWestern Public Service's Big Stone Power Plant)

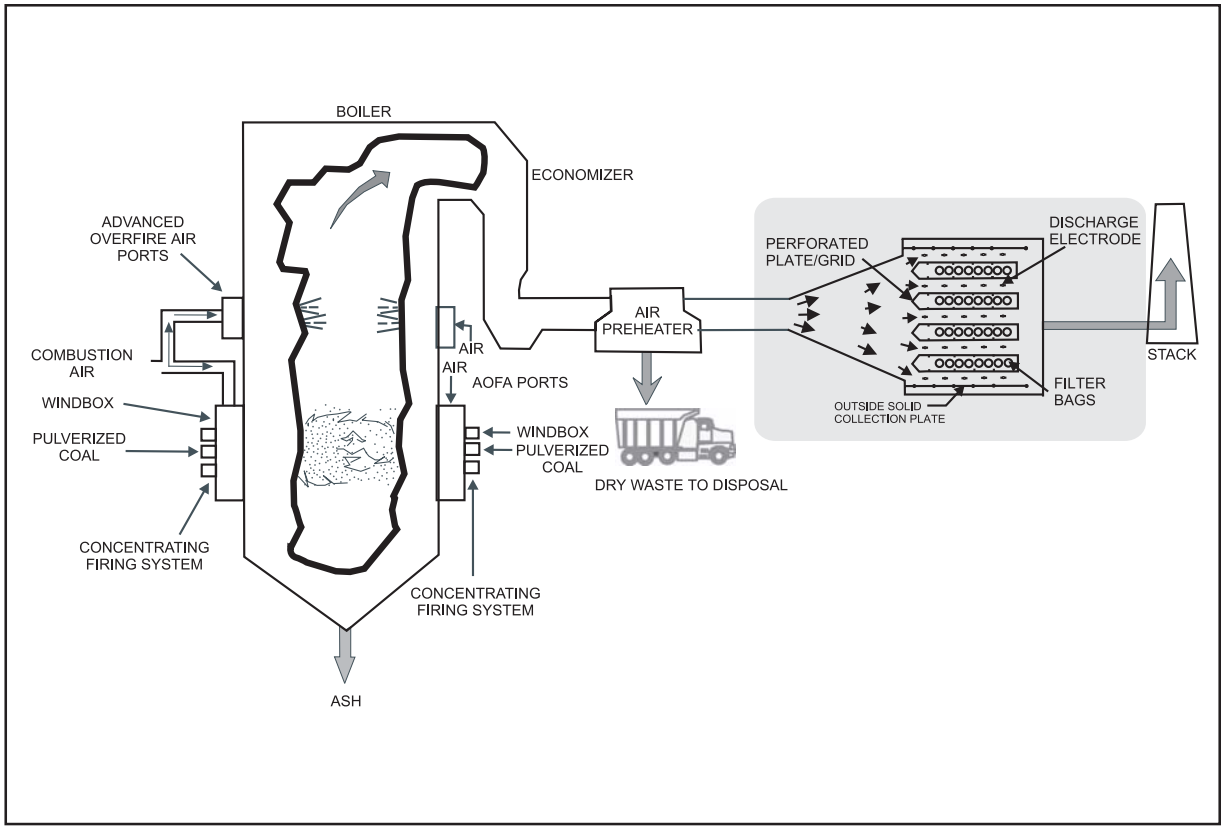
Technology
Advanced Hybrid™ (formerly known as Advanced Hybrid Particulate Collector)

Plant Capacity/Production
450 MW

Coal
Low-sulfur coal

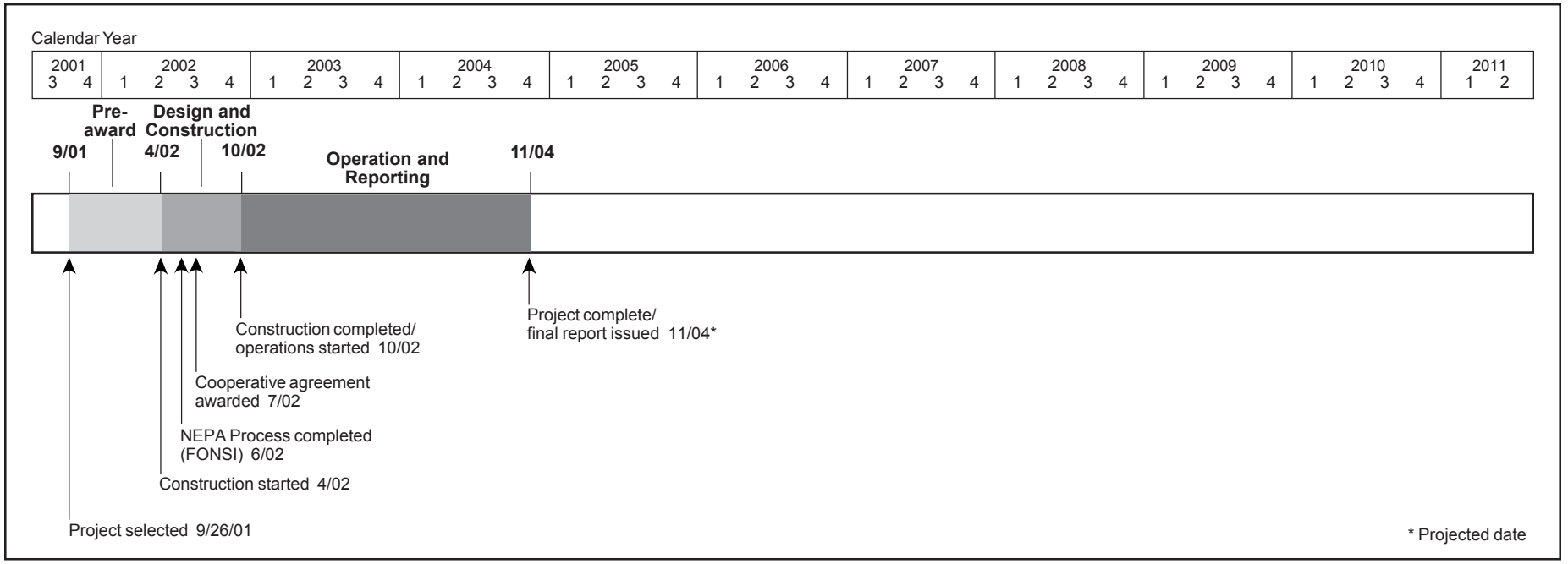
Project Funding

Total	$13,353,288	100%
DOE	6,490,585	49
Participant	6,862,703	51



Project Objective
To demonstrate, in a full-scale application, a hybrid technology that raises the particulate matter capture of coal plants up to 99.99% by integrating fabric filtration and electrostatic precipitation (ESP) in a single unit. The Advanced Hybrid™ overcomes the problem of excessive fine particle emissions that escape collection in ESPs and the reentrainment of dust in baghouses. The overall goal of the project is to demonstrate the Advanced Hybrid™ concept in a full-scale application. Specific objectives are to demonstrate ultra-low fine particulate emissions, low pressure drop, overall reliability of the technology and, eventually, long-term bag life.

Technology/Project Description
The Advanced Hybrid™ combines the best features of ESPs and baghouses in an entirely novel manner. The Advanced Hybrid™ concept combines fabric filtration and electrostatic precipitation in the same housing, providing major synergism between the two methods, both in the particulate collection step and in transfer of dust to the hopper. The Advanced Hybrid™ provides ultra-high collection efficiency, overcoming the problem of excessive fine-particle emissions with conventional ESPs, and solves the problem of reentrainment and re-collection of dust in conventional baghouses.



Project Status/Accomplishments

The project was selected for award on September 26, 2001. A cooperative agreement was awarded July 2, 2002. The NEPA process was completed with the issuance of the Environmental Assessment in June 2002 and the FONSI on June 11, 2002. Construction commenced in July 2002 and was completed in October 2002. Start-up was completed on October 25, 2002.

The first six months of operation showed very good particulate removal efficiency, but at a higher than anticipated pressure drop. Performance testing has shown that the average collection efficiency of the Advanced Hybrid™ is 99.997%. The outlet dust loading is almost two orders of magnitude lower than the guarantee limit of 0.002 grains per actual cubic feet. Operations are continuing with the goal of reducing the overall operating cost, including pressure drop.

Commercial Applications

With new requirements to control respirable particulate matter (less than 2.5 microns in diameter; $PM_{2.5}$), the Advanced Hybrid™ is a superior technology not only for new installations but as a retrofit technology as well. The Advanced Hybrid™ combines a high particulate collection efficiency, with a small footprint and potential economic advantages. Given the age and performance level of many existing ESPs, there is a great and immediate need for this type of retrofit technology. This technology has potential application to all of the more than 1,000 coal-fired units. However, space and other site-specific constraints come in to play to preclude 100% applicability.

The Advanced Hybrid™ is economically competitive with ESPs and baghouses for meeting current standards. For meeting a possible stricter fine-particle standard or 99.99% control of total particulates, the Advanced Hybrid™ is the economic choice over either ESPs or baghouses by a wide margin.